Lesson 5

Feral pig family

Here a Pig, There a Pig…

In this lesson, students revisit ***California Connections: A Tale of Feral Pigs.*** They predict the effects of introduced feral pigs on two ecosystems by applying their understanding of how ecological roles are filled within all ecosystems and biomes.

Students check their predictions against actual occurrences by comparing and contrasting what happened in California with what happened in Australia when feral pigs were introduced into those environments.

Students use worksheets to record their analysis of the impacts feral pigs have had on ecosystems in California and Australia. They explain how the human practice of introducing non-native species has had similar effects on organisms in similar roles in two different biomes (chaparral and savanna).

Through the ***A Tale of Feral Pigs*** story, students begin to explore the effects of human activities on food webs and the ecological roles within them. The lesson leads students to discover that effects of a particular practice on organisms in the same ecological role are similar, even in different biomes.

Background

The spread of feral pigs in California chaparral and Australian savanna biomes has had similar effects in both places because the pigs occupy the same ecological role in both biomes. Feral pigs are

Learning Objective

Explain how human practices make use of and/or have similar effects on organisms that play similar roles in different biomes.

opportunistic omnivores, eating a wide variety of plant and animal organisms including: fruits and seeds; grains; grasses; bulbs; tubers, including crops such as potatoes; fungi; and animal material, including carrion, earthworms, young livestock, and arthropods.

A non-native species, such as feral pigs, directly affects the populations of organisms it eats. It also indirectly affects organisms in the same ecological role—organisms that eat the same things. As pig populations grow, the pigs compete with native omnivores, carnivores, and herbivores for the available food. The pigs consume more and more vegetation and animal material, leaving less food for native species.

Gray fox

As a population of organisms in a particular ecological role changes, such as omnivores in competition with pigs, the flow of matter within the ecosystem changes. This, in turn, affects populations of organisms in other ecological roles. For example, if competition from pigs reduces the population of rabbits or spotted skunks, red-tailed hawks and gray foxes that feed on these species will have less prey, and their populations may also decline.

On Santa Cruz Island and other California Channel Islands, feral pigs changed the food web by attracting a new predator to the islands—golden eagles. The eagles were attracted by the availability of piglets, but they also began to prey on island foxes. In turn, the decreasee in the island fox population affected other organisms in the food web.

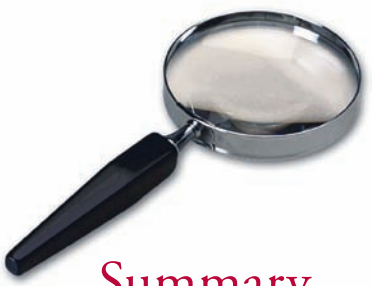
Feral pigs also affect other species through their rooting behavior. Pigs dig into the ground to find roots and tubers, damaging producers (plants) and decomposers in the soil. In addition, the pigs harm plants indirectly because they change the soil structure and they consume worms, which are important to healthy soil.

Key Vocabulary

Competition: The struggle between two or more organisms for limited supplies of food, water, or other resources.

Endemic: Found only in a specified geographic region and nowhere else.

Toolbox



Summary of Activities

Students revisit ***California Connections: A Tale of Feral Pigs.*** They predict and verify the ecological role of the feral pigs in both California and Australia and explore the effects of feral pigs on ecological roles in two similar biomes.

Instructional Support

See Unit Resources, page 36

Prerequisite Knowledge

Students should be able to:

- identify ecological roles in a food web.

Students should have:

- completed Lesson 1.

Advanced Preparation

Gather and prepare Activity Masters:

- Gather from previous lessons:
  - ***California Connections: A Tale of Feral Pigs—Part 1*** from Lesson 1
  - **Same Roles Homework** from Lesson 4

Gather and prepare Materials Needed.

Gather and prepare Visual Aids:

- Prepare transparencies.

A-V equipment:

- Overhead or LCD projector, screen

Materials Needed

Class supplies:
- Pencils

Unit Dictionary:
- Provided separately

Visual Aids

Transparencies:
- **Chaparral and Savanna Food Webs**, Visual Aid #24

Duration

Preparation Time
20 min.
Instructional Time
45 min.

Safety Notes

None

Activity Masters in the Supporting Materials (SM)

Food Facts for Feral Pigs
SM, Page 61
One per student

Make a Pig Prediction
SM, Pages 62–64
One per student

California Connections: A Tale of Feral Pigs—Part 2
SM, Pages 65–67
One per student

Effects of Feral Pigs
SM, Pages 68–71
One per student

Comparison: Feral Pigs in Savanna and Chaparral
SM, Pages 72–73
One per student

Procedures

Vocabulary Development

Use the **Unit Dictionary** and the **Vocabulary Word Wall Cards** to introduce new words to students as appropriate. These documents are provided separately.

Step 1

Ask students to share examples of herbivores, omnivores, carnivores, and decomposers from different biomes, as listed on their **Same Roles Homework** (Lesson 4 Activity Master).

Step 2

Tell students that they are going to return to the story about feral pigs in ***A Tale of Feral Pigs*—Part I** (Lesson 1 Activity Master) and apply what they have learned about ecological roles in different biomes to that story. Have the class summarize what they recall of ***A Tale of Feral Pigs*—Part I**. (*It told how domesticated pigs were introduced to both California and Australia and explained how feral populations have grown in the chaparral and savanna biomes.*) Ask students to predict the ecological role that feral pigs play in a food web. (*Omnivores, but do not reveal this information.*) Ask students if they think the ecological role of the pigs is the same in both California and Australia. (*Yes*)

Step 3

Distribute **Food Facts for Feral Pigs** (Lesson 5 Activity Master). Have students read the food facts to themselves. Ask students, "Based on this information, what ecological role do feral pigs play?" (*Omnivores*) "What did you find most interesting about the eating habits of feral pigs?" (*Answers will vary.*)

Project the transparency of **Chaparral and Savanna Food Webs** (Visual Aid #24). Ask students to name the other omnivores in these two biomes. (*Coyote, California quail, blue-faced honeyeater.*) Explain to students that organisms that have the same role in a food web are in competition with each other; they both need the same food, water, or resources.

Step 4

Pair students and distribute copies of **Make a Pig Prediction** (Lesson 5 Activity Master). Have half the student pairs start working on the California chaparral side of the worksheet, and the other half start working on the Australian savanna side of the worksheet. Tell students to use the food webs on **Make a Pig Prediction** to predict the effects of growing numbers of feral pigs in the chaparral or savanna. Give pairs 15 minutes to complete their portion of the **Make a Pig Prediction**. (*Note: If time permits, pairs that finish one side of the **Make a Pig Prediction** can turn their page over and work on the other side.)*

Step 5

Distribute copies of ***California Connections: A Tale of Feral Pigs—Part 2*** (Lesson 5 Activity Master). Ask students to read the description of the effects of feral pigs in Australian savanna and California chaparral biomes. Ask students how well they predicted the effects on the ecosystems of introducing feral pigs. Where did their predictions match the actual outcome? What effects did they overlook?

Step 6

Distribute copies of **Effects of Feral Pigs** (Lesson 5 Activity Master), which shows the California chaparral food web on one side and the Australia savanna food web on the other. Have students work independently to complete the task sheet. (An Answer Key is provided in the Lesson Assessment section, pages 118–121.)

Step 7

Distribute **Comparison: Feral Pigs in Savanna and Chaparral** (Lesson 5 Activity Master) and ask students to complete the assignment as homework. (An Answer Key is provided in the Lesson Assessment section, page 122.)

Lesson Assessment

Description

This lesson teaches students that human practices affect organisms in similar ecological roles in similar ways. In Step 6, students complete **Effects of Feral Pigs** (Lesson 5 Activity Master), demonstrating their understanding that feral pigs affected food webs and other species in both California and Australia. Through the homework assignment in Step 7, **Comparison: Feral Pigs in Savanna and Chaparral** (Lesson 5 Activity Master) students show they can compare the effects of introducing a non-native species in two different biomes. The final question on the assignment assesses students' ability to explain how this particular human practice has had similar effects on organisms in similar ecological roles in both the savanna and chaparral biomes.

Suggested Scoring

Make a Pig Prediction (Lesson 5 Activity Master) is an ungraded activity. **Effects of Feral Pigs** (Lesson 5 Activity Master) is worth a total of 20 points; award two points for each correct answer. **Comparison: Feral Pigs in Savanna and Chaparral** is worth a total of 10 points; award six points for an accurate Venn diagram (two points per section) and four points for the final short answer question. Partial credit may be given on all responses.

Answer Key and Sample Answers

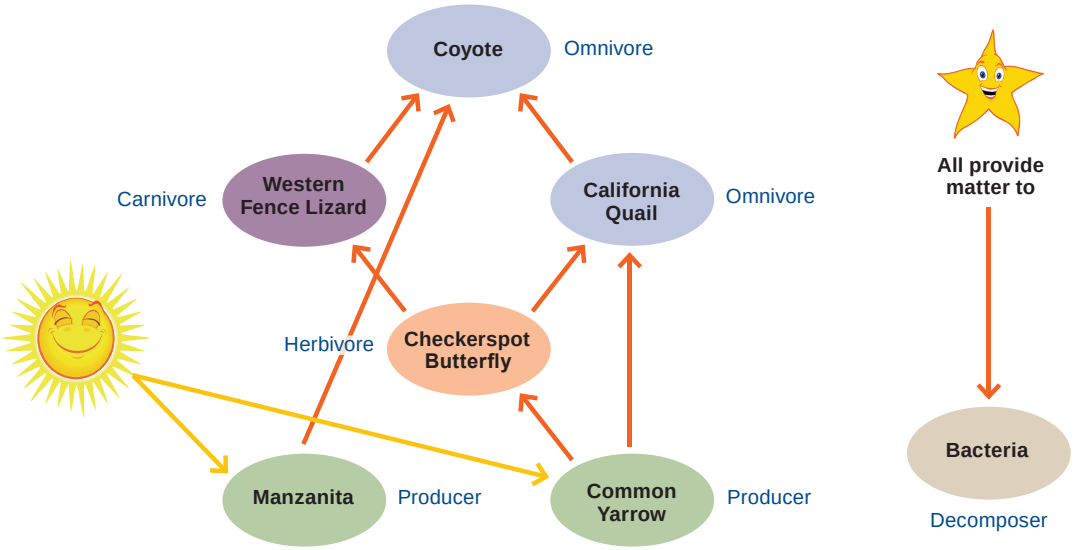
Make a Pig Prediction

Lesson 5 Activity Master | *page 1 of 3*

Name: _____

California Chaparral Biome

Review this food web for an ecosystem in the California chaparral biome. Remember, there are many more organisms with connections to the ones you see here. Use the **Food Facts for Feral Pigs** handout to help you answer the questions below.



1. What organisms in this food web might feral pigs like to eat?

   Quail eggs, lizards, manzanita roots

2. What organisms in this food web might prey on feral pigs?

   Coyote

3. What is the ecological role of the feral pig in this biome: producer, herbivore, omnivore, carnivore, or decomposer?

   Omnivore

4. What other organisms have the same role?

   Quail, coyote

Make a Pig Prediction

Lesson 5 Activity Master | *page 2 of 3*

Name: _____

5. Based on your answers, predict two or three ways you think introducing feral pigs would affect this ecosystem in the chaparral.

a. The pigs would eat the quail eggs, baby quail, and lizards, reducing their populations.

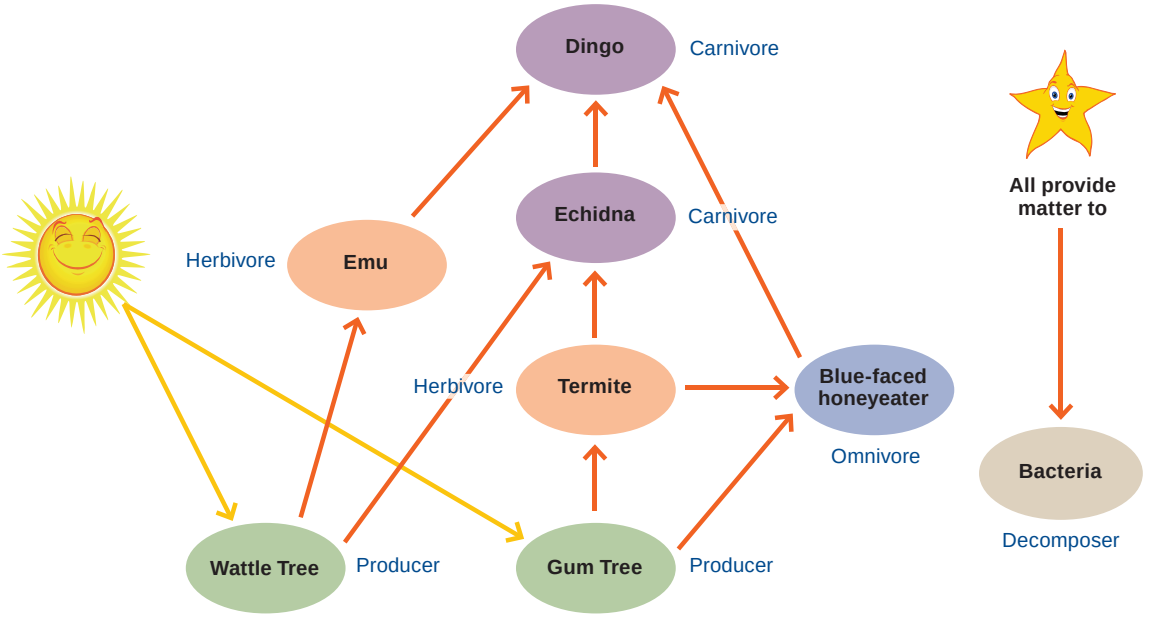
(Students may also include butterflies, as the reading indicates they eat insects.)

b. The pigs would dig up the manzanita roots and eat the yarrow, reducing their populations.

c. Advanced answer: Reducing the quail and lizard populations could affect populations of their predators, including the coyote, and the organisms they feed on.

Australian Savanna Biome

Review this food web for an ecosystem in the Australian savanna biome. Remember, there are many more organisms with connections to the ones you see here. Use the **Food Facts for Feral Pigs** handout to help you answer the questions below.



Answer Key and Sample Answers

Make a Pig Prediction

Lesson 5 Activity Master | *page 3 of 3*

Name: _____

1. What organisms in this food web might feral pigs like to eat?

   Termites, echidnas, emu eggs

2. What organisms in this food web might prey on feral pigs?

   Dingos

3. What is the ecological role of the feral pig in this biome: producer, herbivore, omnivore, carnivore, or decomposer?

   Omnivore

4. What other organisms have the same role?

   Blue-faced honeyeater

5. Based on your answers, predict two or three ways you think introducing feral pigs would affect this ecosystem in the savanna.

   a. They could reduce the populations of echidnas, emus, and termites.

   b. They could provide prey for dingos.

   c. Advanced answer: By feeding on echidna, emu eggs, and termites, they could affect the populations of their predators, including the blue-faced honeyeater and the dingo, and the organisms they feed on.

Effects of Feral Pigs

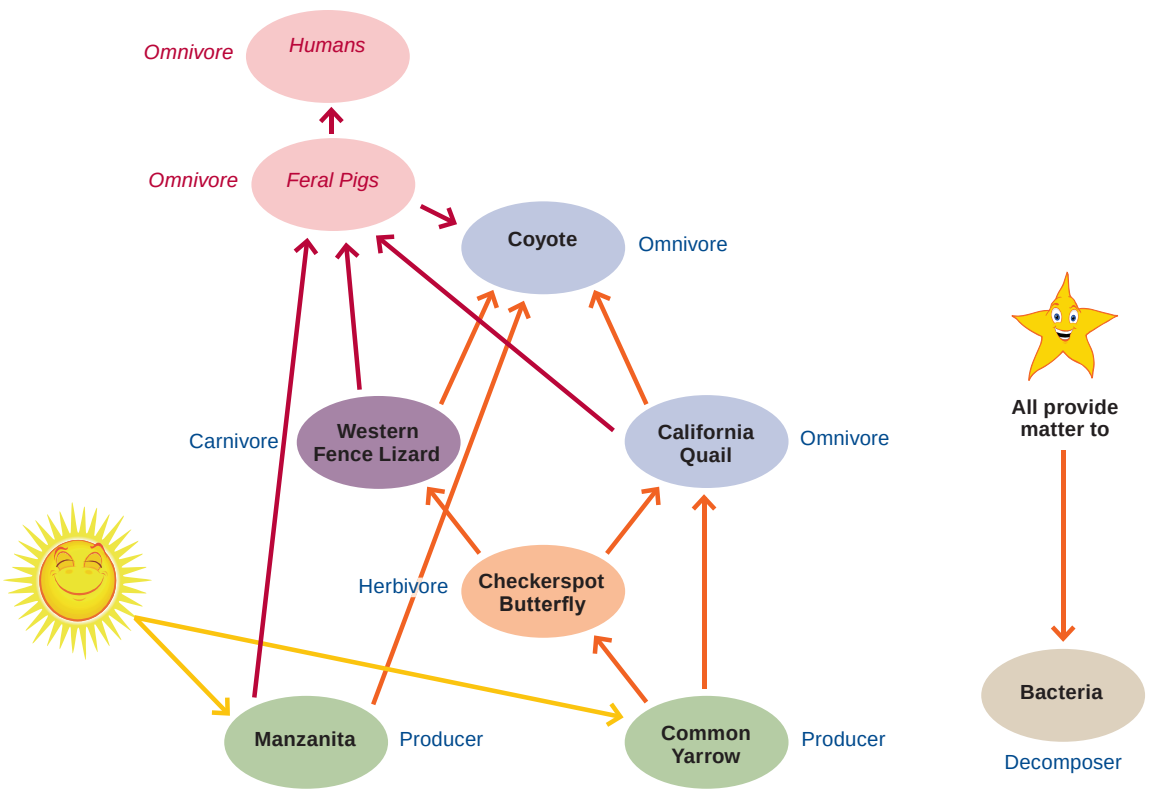
Lesson 5 Activity Master | *page 1 of 4*

Name: _____

Feral Pigs: California's Experience

Complete this activity based on what you read in ***A Tale of Feral Pigs—Part 2*** and the **Unit Dictionary**.

1. Add human beings and feral pigs to this food web. Draw in arrows to connect the feral pigs and humans to what they eat and what eats them. Look back at the story for help. Fill in the ecological role of the humans and the pigs.



Answer Key and Sample Answers

Effects of Feral Pigs

Lesson 5 Activity Master | *page 2 of 4*

Name: _____

2. What other organisms in this web have the same role as the pigs?

Coyote, California quail, and humans.

3. What organisms do the pigs directly affect? (Eating them or being eaten by them)

They eat manzanita roots, lizards, quail eggs, and worms and grubs. Humans hunt them, and coyotes may be able to eat their piglets.

4. What organisms might the pigs indirectly affect? For example, do the pigs compete with another organism in the same role? Do they increase or decrease a population? Do those changes affect other populations?

They compete with coyotes. If they eat many quail eggs and lizards, there may be less food for coyotes. Fewer quail and lizards might mean more insects like butterflies. (More butterflies may positively affect the yarrow.)

5. According to the story, what organisms are affected by the pigs' rooting behavior? (Include organisms in the food web, as well as others.)

Manzanita roots and common yarrow, as well as grasses and wildflowers; bacteria, worms and grubs in the soil

Effects of Feral Pigs

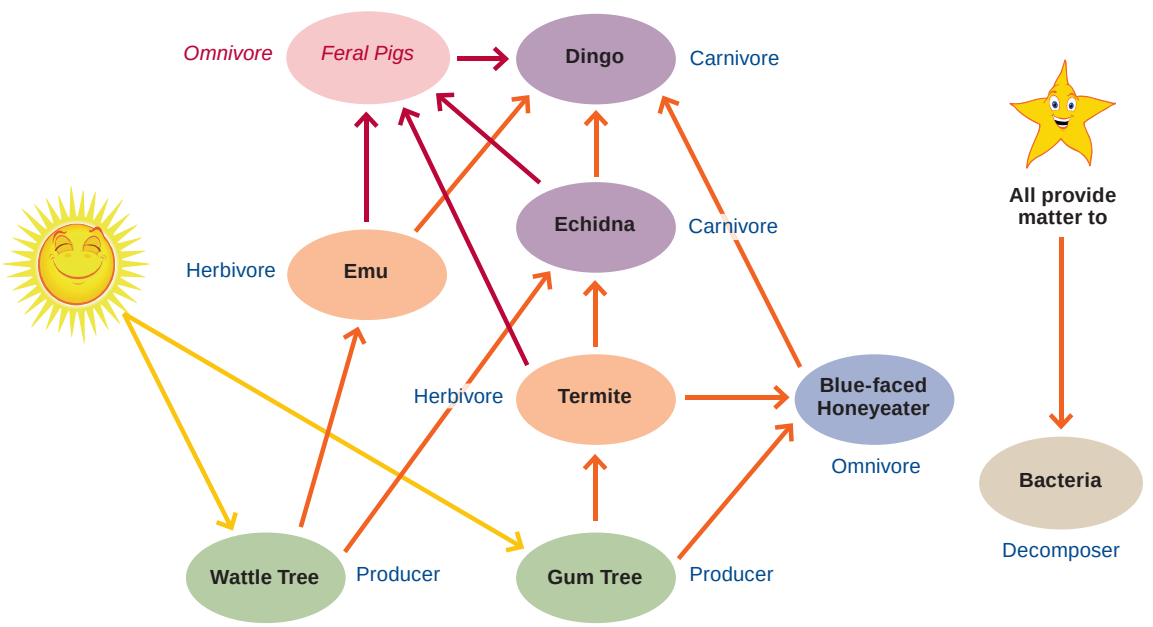
Lesson 5 Activity Master | *page 3 of 4*

Name: _____

Feral Pigs: Australia's Experience

Complete this activity based on what you read in ***A Tale of Feral Pigs—Part 2*** and the **Unit Dictionary**.

1. Add feral pigs to this food web. Draw in arrows to connect the feral pigs to what they eat and what eats them. Look back at the story for help. Fill in the ecological role of the pigs.



2. What other organisms fill the same ecological roles as the feral pig?

   Blue-faced honeyeater

3. What organisms do the pigs directly affect? (Eating them or being eaten by them)

   They are eaten by dingos, which may increase the dingo population. They eat emu eggs, emu chicks, echidnas, and termites, so these populations may decrease.

Answer Key and Sample Answers

Effects of Feral Pigs

Lesson 5 Activity Master | *page 4 of 4*

Name: _____

4. What organisms might the pigs indirectly affect? For example, do the pigs compete with another organism in the same role? Do they increase or decrease a population? Do those changes affect other populations?

Reducing emu, echidna, and termite populations may in turn increase the wattle tree and gum tree populations and may decrease dingo and blue-faced honeyeater populations.

5. According to the story, what is another way that feral pigs can affect ecosystems in Australia?

They can spread illness to livestock (sheep and cattle) and other animals.

Comparison: Feral Pigs in Savanna and Chaparral

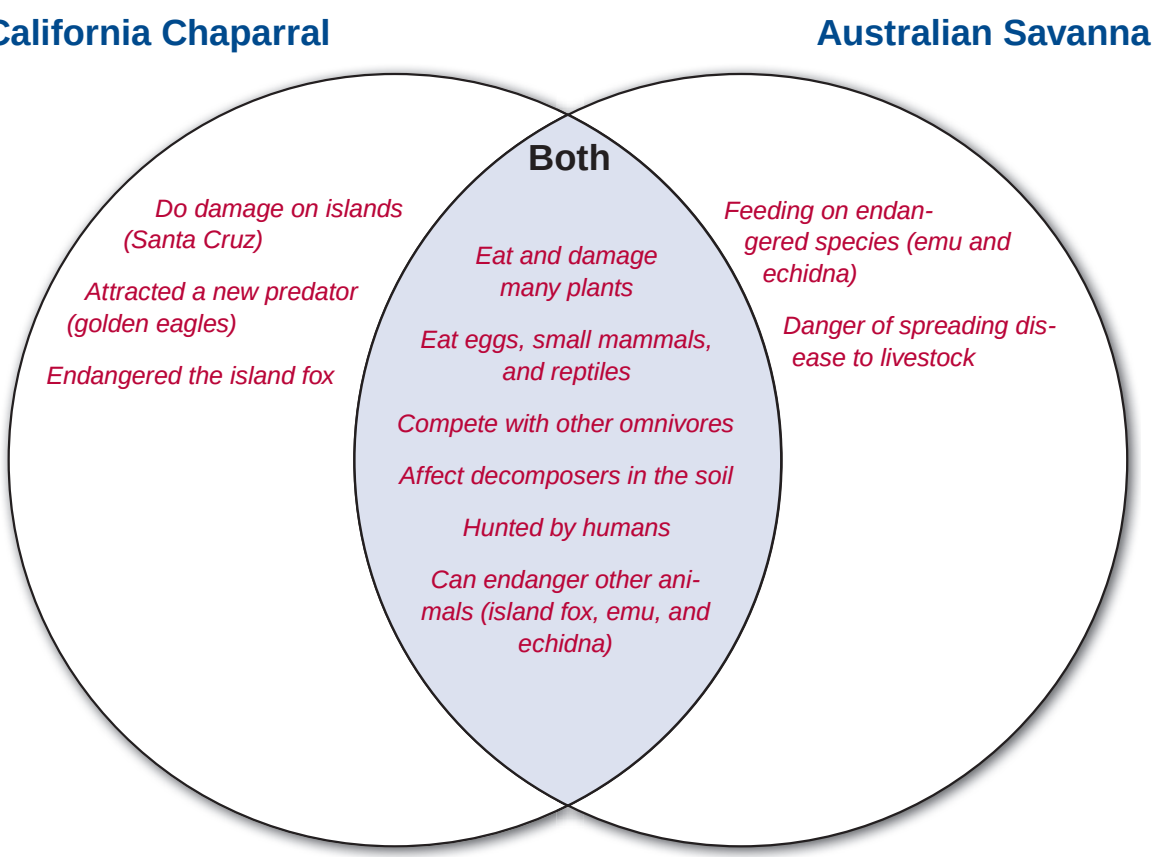
Lesson 5 Activity Master | *page 1 of 2*

Name: _____

Use this Venn diagram to compare and contrast the effects of pigs in two different biomes.

Humans introduced pigs into both Australia and California. Eventually, some of the pigs escaped and became wild. ***A Tale of Feral Pigs—Part 2*** describes the effects of the pigs in two different biomes: chaparral in California and savanna in Australia.

Did the pigs have the same ecological role in both biomes? How were the effects the same in both places, and how were they different? Complete the Venn diagram below to answer these questions.



Answer Key and Sample Answers

Comparison: Feral Pigs in Savanna and Chaparral

Lesson 5 Activity Master | *page 2 of 2*

Name: _____

Based on your Venn diagram, explain how feral pigs have had similar effects on organisms in the same ecological roles in California and in Australia. Describe how they have affected producers, herbivores, omnivores, carnivores, and decomposers.

In both places, feral pigs are omnivores, eating both plants and animals. Therefore, in both places the pigs directly affected the plants (producer role) and animals (herbivore, omnivore, and carnivore roles). In addition, by tearing up the soil they affected decomposers in both places. As omnivores, in both places they indirectly affected other omnivores (and carnivores and herbivores) through competition for food.

Food Facts for Feral Pigs

Lesson 5 Activity Master

Name: _____

Feral pigs need to drink water every day.

Feral pigs eat many types of foods, including:

- acorns and the seeds of many plants
- the stalks, roots, and bulbs of many plants
- agricultural crops including sugarcane in Australia and vineyard grapes in California
- insects
- lizards and frogs
- ground-nesting baby birds and eggs
- small mammals
- dead animals

Dingos and wild dogs in Australia may eat piglets.

In California, cougars are the only predator that can kill adult pigs, but coyotes and black bears feed on piglets. People hunt feral adult pigs for sport.

A Tale of Feral Pigs: Part 2

Feral pigs have similar ecological roles in the California chaparral and the Australian savanna. In both biomes, human beings are the pigs' major predator, although coyotes in California and dingoes in Australia can kill piglets. Many hunters think feral pigs are special since they are an "exotic" animal.

Even though they can hunt feral pigs every day of the year, hunters cannot keep up with the increasing pig population. Feral pigs can give birth to up to two litters a year. Each litter may have from five to six piglets.

Pigs damage local habitat because they eat almost anything. Because there are so many of them, they can upset the ecological balance in a local area. Pigs plunge their tough, flexible snouts into the topsoil, foraging for food. This is called "rooting." Beside eating grasses and roots, they dig for worms and grubs. Worms and grubs are important members of the food web because of their role as decomposers.

The feral pig's rooting action can sometimes reach as deep as three feet. One pig can disturb an entire acre of soil in just one day. By upsetting the soil, rooting can decrease its richness. After the pigs leave

Feral pig and piglets

Pig rooting

an area, sometimes only the toughest weeds can grow there.

Because pigs cannot sweat like humans, they cool off by rolling in wet soil. This is called "wallowing." Wallowing can expose bare soils to erosion during the rainy season and foul important water sources.

Feral pigs live in over half of California's 58 counties. They feed on grasses and weeds or wildflowers in the spring. During summer and fall, they eat acorns and fruits. Throughout the year, they feed on roots, worms, grubs, birds' eggs, frogs, and lizards. However, if these food sources are not available, pigs turn to other sources for their food. A good example of this is found on Santa Cruz Island, the largest of the Channel Islands. There, these feral pigs have completely changed the food web.

The Channel Islands are a few miles off the coast of Central and Southern California. Several plants and animals that live on the islands are endemic. This means that they cannot be found anywhere else in the world. Many years ago, pigs were introduced to several of the islands. They began rooting up native plants. The rooting caused a lot of soil erosion. It also spread weeds that are not native to the area. In a few places, the pigs even destroyed ancient Chumash Indian archaeological sites.

In the last few years, the pigs have attracted golden eagles to the island. The eagles like to eat piglets. The eagles also found that island foxes native to the island make a tasty meal. Today, less than 100 foxes remain on Santa Cruz Island. Recently, conservation groups began working to save the island fox. They decided that all pigs and golden eagles must be removed from the island so that the island fox can survive.

Many groups like those working on Santa Cruz Island are also at work in Australia. In Australia, the feral pig population is growing so fast, biologists cannot keep up with the damage the pigs cause. Today, about 4 million feral pigs run wild in the savanna,

floodplains, and wetlands of northern Australia. The wild pigs eat mostly plants. They also eat small animals. The pig's diet includes grasses, leaves, fruits, nuts, berries, insects, frogs, reptiles, birds' eggs, and small mammals, including the echidna (spiny anteater). Some of these plants and animals are now endangered or extinct in areas where the pigs live. Biologists are beginning to believe that the only way to protect habitat is to remove the pigs from some areas.

Echidna

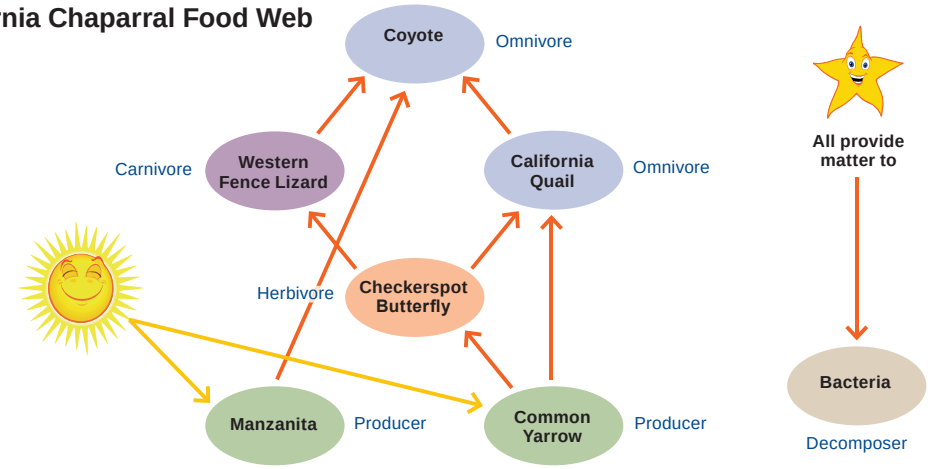
Ranchers and farmers in Australia are also worried because they know that feral pigs can spread sickness to other animals. In 2001, hoof-and-mouth disease was a big problem in the United Kingdom. People were worried that the disease might come to Australia on a ship or plane. If that happened, hoof-and-mouth disease could infect the feral pigs. The sickness could spread very quickly to animals on farms and ranches. Many herds of sheep and cattle would have to be destroyed.

Golden Eagle

Feral pigs cause problems in both the California chaparral and the Australian savanna. The problems in these biomes are much the same. The existence of feral pigs in California and Australia demonstrate the costs, both to economic systems and to natural systems, of the introduction of non-native species.

Chaparral and Savanna Food Webs

California Chaparral Food Web



Australian Savanna Food Web